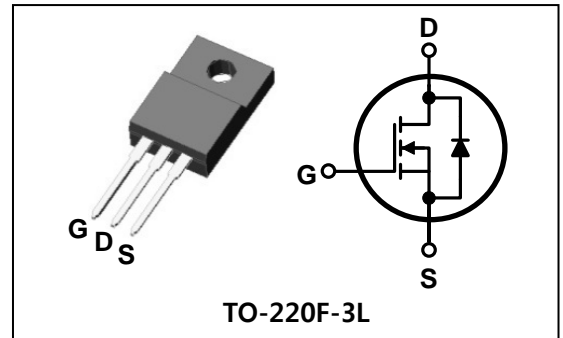


## SWITCHING REGULATOR APPLICATIONS

### Features

- High Voltage :  $BV_{DSS}=650V(\text{Min.})$
- Low  $C_{RSS}$  :  $C_{RSS}=13pF(\text{Typ.})$
- Low gate charge :  $Qg=45nC(\text{Typ.})$
- Low  $R_{DS(on)}$  :  $R_{DS(on)}=0.9\Omega(\text{Max.})$

### PIN Connection



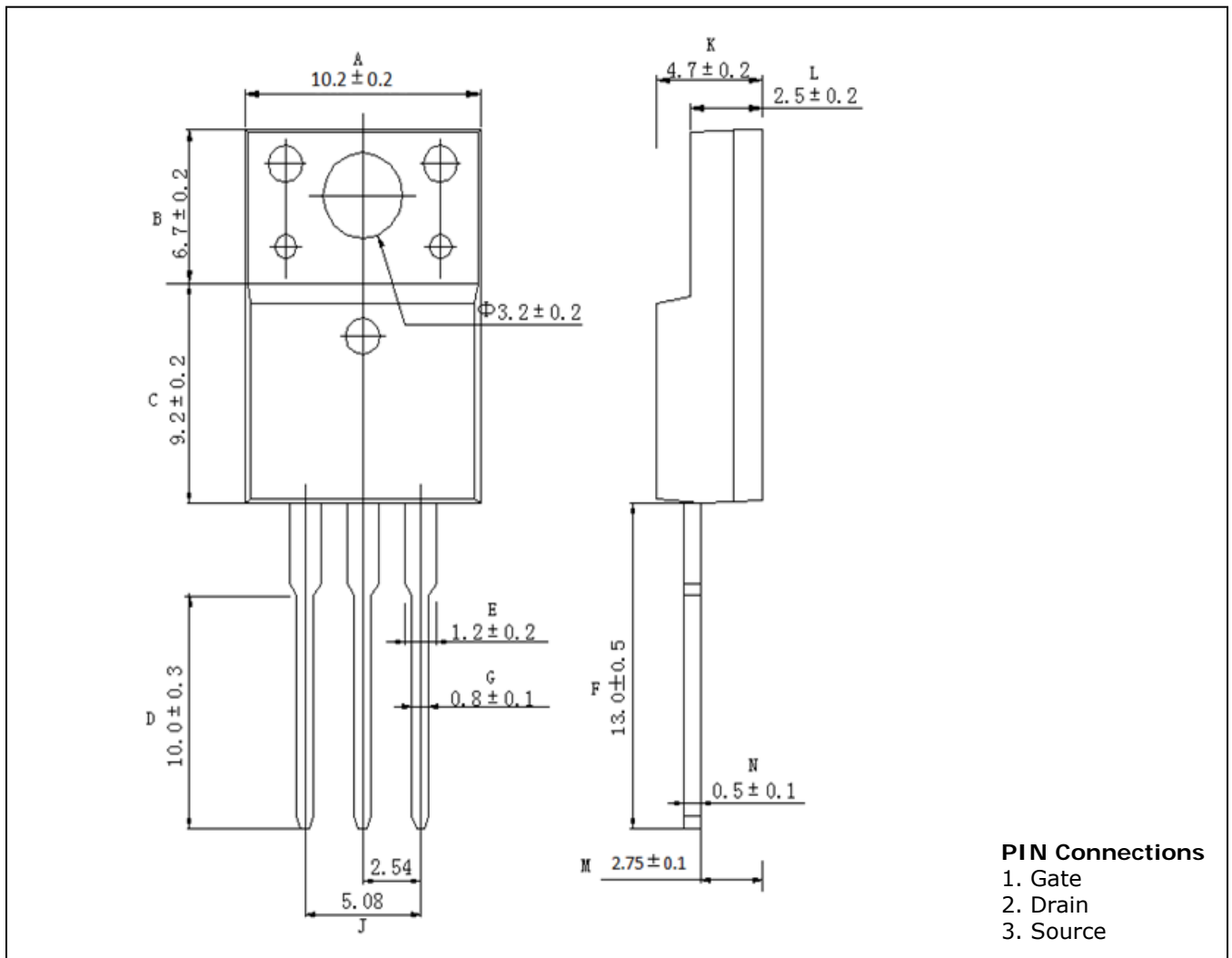
TO-220F-3L

### Ordering Information

Type NO.	Marking	Package Code
MF10N65	MF10N65	TO-220F-3L

### Outline Dimensions

unit : mm



## Absolute maximum ratings (T<sub>C</sub>=25°C unless otherwise noted)

Characteristic	Symbol	Rating	Unit	
Drain-source voltage	V <sub>DSS</sub>	650	V	
Gate-source voltage	V <sub>GSS</sub>	±30	V	
Drain current (DC) *	I <sub>D</sub>	T <sub>C</sub> =25°C	10	A
		T <sub>C</sub> =100°C	5.5	A
Drain current (Pulsed) *	I <sub>DM</sub>	40	A	
Power dissipation	P <sub>D</sub>	50	W	
Avalanche current (Single) ②	I <sub>AS</sub>	10	A	
Single pulsed avalanche energy ②	E <sub>AS</sub>	480	mJ	
Avalanche current (Repetitive) ①	I <sub>AR</sub>	10	A	
Repetitive avalanche energy ①	E <sub>AR</sub>	11.6	mJ	
Junction temperature	T <sub>J</sub>	150	°C	
Storage temperature range	T <sub>stg</sub>	-55~150		

\* Limited by maximum junction temperature

Characteristic		Symbol	Typ.	Max.	Unit
Thermal resistance	Junction-case	R <sub>th(J-C)</sub>	-	2.5	°C/W
	Junction-ambient	R <sub>th(J-A)</sub>	-	62.5	

## Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Drain-source breakdown voltage	BV <sub>DSS</sub>	I <sub>D</sub> =250μA, V <sub>GS</sub> =0V	650		-	-	
Gate threshold voltage	V <sub>GS(th)</sub>	I <sub>D</sub> =250μA, V <sub>DS</sub> =V <sub>GS</sub>	2.0	-	4.0	V	
Drain-source cut-off current	I <sub>DSS</sub>	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V	-	-	1	μA	
Gate leakage current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V	-	-	±100	nA	
Drain-source on-resistance ④	R <sub>DS(on)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =5.0A	-	0.75	0.9	Ω	
Forward transfer conductance ④	g <sub>fs</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =5.0A	-	8.0	-	S	
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V f=1 MHz	-	1600	2350	pF	
Output capacitance	C <sub>oss</sub>		-	110	160		
Reverse transfer capacitance	C <sub>rss</sub>		-	13	18		
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> =300V, I <sub>D</sub> =10A R <sub>G</sub> =25Ω	-	23	-	ns	
Rise time	t <sub>r</sub>		-	69	-		
Turn-off delay time	t <sub>d(off)</sub>		③ ④	-	144		-
Fall time	t <sub>f</sub>		-	77	-		
Total gate charge	Q <sub>g</sub>	V <sub>DS</sub> =480V, V <sub>GS</sub> =10V I <sub>D</sub> =10A	-	45	-	nC	
Gate-source charge	Q <sub>gs</sub>		③ ④	-	7.5		-
Gate-drain charge	Q <sub>gd</sub>		-	18.5	-		

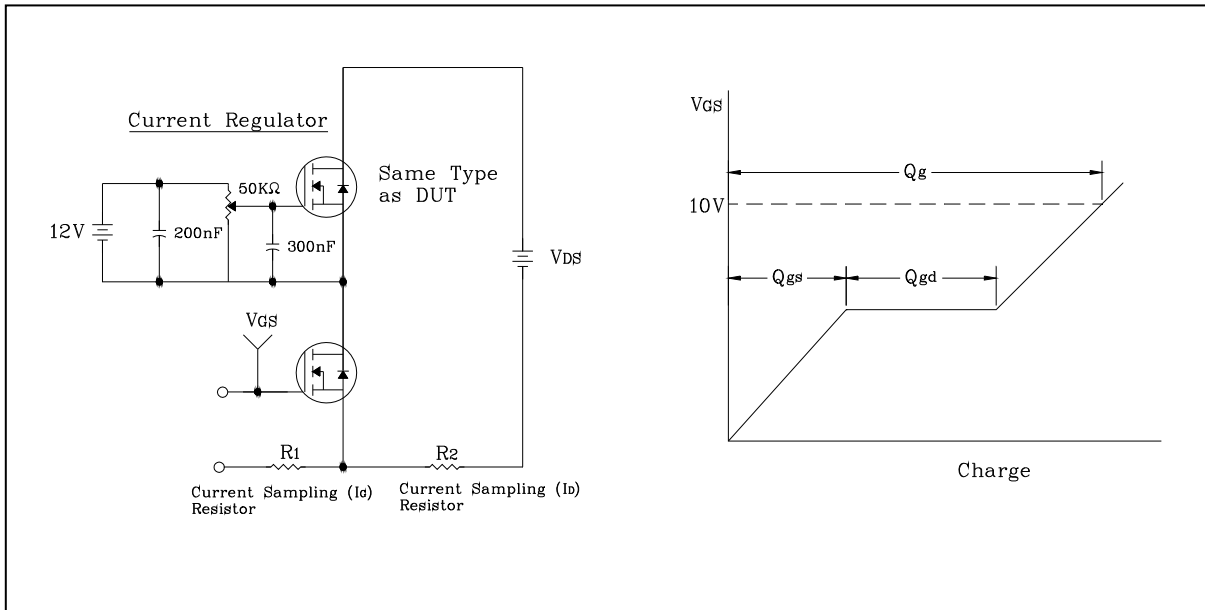
## Source-Drain Diode Ratings and Characteristics (T<sub>C</sub>=25°C unless otherwise noted)

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Source current (DC)	I <sub>S</sub>	Integral reverse diode in the MOSFET	-	-	10	A
Source current (Pulsed) ①	I <sub>SM</sub>		-	-	40	
Forward voltage ④	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =10A	-	-	1.4	V
Reverse recovery time	t <sub>rr</sub>	I <sub>S</sub> =10A, V <sub>GS</sub> =0V dI <sub>F</sub> /dt=100A/μs	-	420	-	ns
Reverse recovery charge	Q <sub>rr</sub>		-	4.2	-	μC

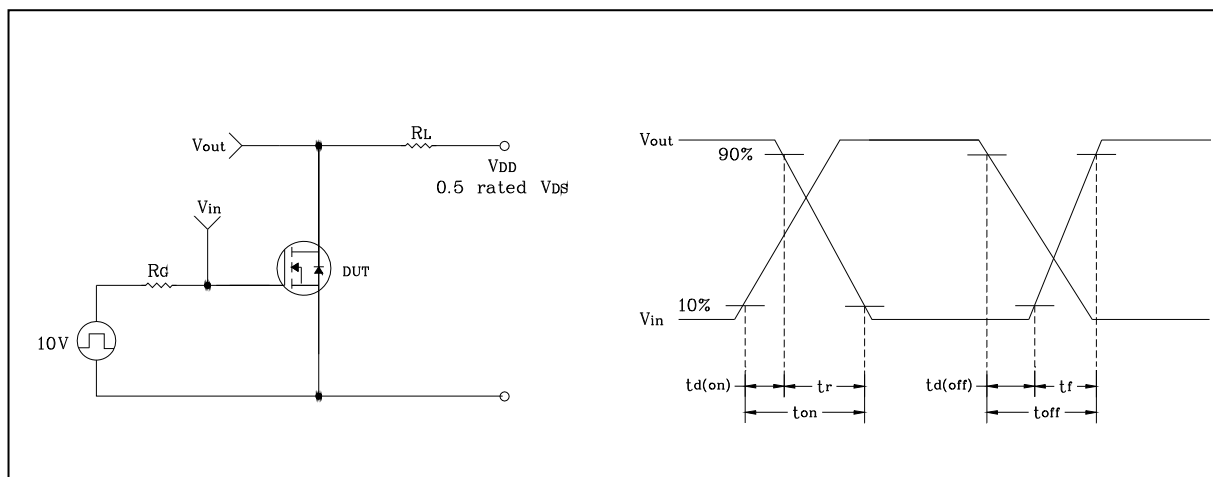
Note ;

- ① Repetitive rating : Pulse width limited by maximum junction temperature
- ② L=10mH, I<sub>AS</sub>=10A, V<sub>DD</sub>=50V, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25 °C
- ③ Pulse Test : Pulse width≤300μs, Duty cycle≤2%
- ④ Essentially independent of operating temperature

**Fig. 11 Gate Charge Test Circuit & Waveform**



**Fig. 12 Resistive Switching Test Circuit & Waveform**



**Fig. 13  $E_{AS}$  Test Circuit & Waveform**

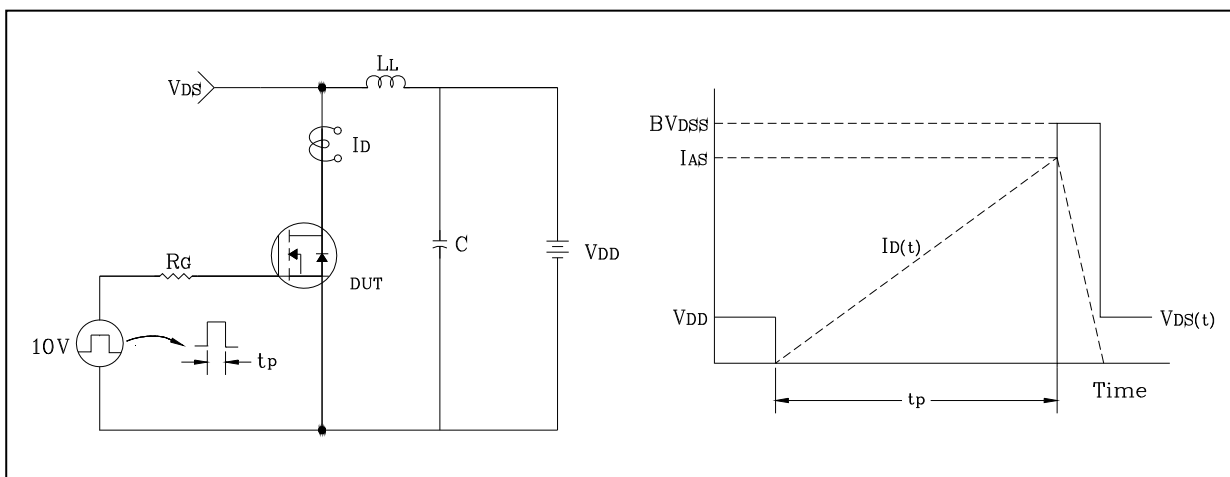


Fig. 14 Diode Reverse Recovery Time Test Circuit & Waveform

